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In Situ Conservation of Farm Animal Genetic Resources

There are two broad approaches through which farm animal genetic resources (AnGR) can be conserved: *ex situ* and *in situ*. *Ex situ* approach to conservation includes methods such as cryopreservation and live animal conservation in designated localities (e.g., government farms). *In situ* conservation encompasses entire agroecosystems, including immediately useful species (e.g., crops, forages, agroforestry species, other animal species) that form part of the system.

In situ conservation is defined as "the continuous husbandry of a diverse set of populations by farmers in the agroecosystems where an animal population/breed/strain has evolved."

It is the management of viable populations (by farmers) in the agroecosystems where they have developed their distinctive properties.

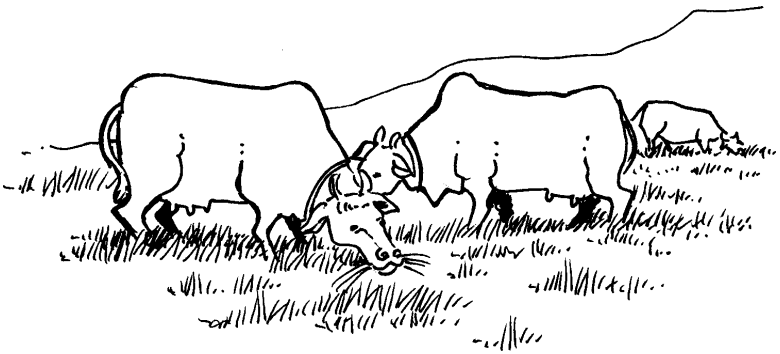
The following objectives may underpin an *in situ* conservation program:

- To conserve the processes of evolution and adaptation of animal populations to their environments.
- To conserve diversity at all levels - ecosystem, species and within species (breeds and genes).
- To integrate farmers (mixed farmers, pastoralists) into a national AnGR system.
- To conserve ecosystem services which are critical to the functioning of the earth's life-support system (i.e., maintaining soil-forming processes, reducing chemical pollution, restricting spread of animal and plant diseases, etc).
- To improve the livelihood of resource-poor farmers through economic and social development (i.e., combining *in-situ* conservation with development of local infrastructure, or increasing access by farmers to locally-relevant animal and plant (forage) germplasm).
- To develop systems to make conserved material (i.e., semen for local use) or conditions easily accessible to farmers.

Advantages and Disadvantages of *In Situ* Conservation of AnGR

One major advantage of AnGR is that it conserves both the genetic material and the processes that give rise to the diversity. Thus, adapted indigenous breeds can be co-conserved with wild species, maximizing system output sustainably. Long-term sustainability of breeding efforts may depend on the continued availability of the genetic variation that can be maintained and further developed by the herders themselves using their own management practices. Moreover, because the technology for cryopreservation of AnGR is only well-developed for a handful of livestock species, conservation of most livestock species will continue to depend on *live animals.* In almost all cases, interventions supporting continued evolution (in response to changes in the production system) is cheaper and more effective for AnGR *in situ* conservation.

Unfortunately, *in situ* conservation also has some drawbacks. The first one is that the same factors that allow for dynamic, holistic, agroecosystem conservation, may serve to threaten the security of breeds/strains. For example, genetic erosion can still occur due to unforeseen circumstances such as war and natural disasters. Moreover, social and economic change may either foster or hinder *in situ* AnGR conservation over time. Indeed, one of the challenges of *in situ* conservation research is to evaluate how economic development is affecting farmer maintenance of diversity so as to account for this process in the implementation of conservation programs.



Community-based Management and *In Situ* Conservation of AnGR

The role of community-based conservation has received increasing attention from the realization that most creative and productive activities of individuals or groups in society take place in communities. As local communities have vested interests in all the natural resources (including AnGR) on which their livelihoods depend, and have the most to lose in the event of loss of these resources, they are best placed to conserve them. Moreover, they have a better understanding, than any other group, of what it takes to sustainably manage their traditional resources. Community-based management of

AnGR refers to a system of AnGR and ecosystem management. AnGR keepers are responsible for the decisions on definition, priority-setting and the implementation of all aspects of its conservation and sustainable use.

Conserved animal material in *ex situ* systems is more likely to be utilized in emergency restoration but is much less likely to find use in long-term animal improvement programs.

In situ conservation and community-based management of AnGR are conceptually similar. However, there are subtle but significant differences. Conservation of AnGR has been defined as the sum of all actions involved in the management of AnGR, such that these resources are best used to meet *immediate* and *short term* requirements for food and agriculture, and remain available to meet possible longer term needs.

On the other hand, management of AnGR is the combined set of actions by which a sample, or the whole of an animal population is subjected to a process of genetic and/or environmental manipulation. Its aim is to sustain, utilize, restore, enhance and characterize the quality and/or quantity of the AnGR and its products (i.e., food, fibre, draught animal power, etc). From this definition, it is clear that 'management' of AnGR encompasses all activities, which ensure that the population is dynamic and is responsive to changes in the physical and socio-cultural environment.

In crop agriculture, participatory plant breeding is now generally accepted and widely applied in many developing countries. Livestock development remains primarily driven by imported technological packages (i.e., artificial insemination, exotic germplasm) and very limited involvement of communities in their implementation.

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